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Editorial

Photovoltaics (PV) is a source of electricity of very fast increasing investments and thanks to research it is strongly developing in view of energy saving. One of its main research goals is to increase the conversion efficiency and to reduce the manufacturing costs of solar modules and systems. In this respect the most ambitious target of the European Union (EU) Energy and Climate Package for 2020 is to increase by up to 20%the level of this renewable energy in the EU's overall final energy consumption. The PV industry has been growing at a steady annual rate of 25–30% over the past several years. This progress was driven chiefly, but not exclusively, by silicon-based solar cells, which now constitute nearly 90% of the global market, characterised by the use of very thin silicon wafers, advanced solar cell designs and processing, innovative module assembly. At the same time, III–V, CIGS and CdTe solar cells are obtaining improved efficiency and raise a rapidly increasing interest by Industry. Additionally, the third-generation approaches to PV aim to achieve very high-efficiency devices for sunlight harvesting, but still use thin-film, second generation deposition methods in order to obtain technologies compatible with large-scale implementation of PVs by non-toxic and not limited in abundance materials.

In this frame major attention is paid to structural defects which result in deep-gap or tail states in thin films and are of great importance for the electronic quality of the PV materials. The influence of these states on structural properties of the films determines the performance of solar cells and investigation and understanding of such defects are still challenging.

These are the proceedings of the E-MRS Fall Meeting 2010, Symposium C, which constituted an ideal forum for researchers of Academy and Industry to discuss state-of-the art results and promising developments in materials and devices for PV. It was focused mainly, but not exclusively, to the following issues: i) scientific aspects of the different approaches to PV for achieving high-efficiency low-cost materials/devices, ii) the use of these materials/devices in the fields of energy saving, paying attention to the economic, environmental and political issues. A mutual exchange of knowledge among scientists of Academy and Industry will be fruitful to approach the theoretical limiting efficiencies, in order to dramatically increase the performance of photovoltaic cells and greatly advance also the solar fuel producing technologies.

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